Besides the normal type of binary alloys, in which eutectics are observable, there is a second type consisting of alloys of metals which form isomorphous mixtures with each other. These alloys, whatever may be their composition, consist of only one species of crystals, which fill the whole space, the composition and the properties of the alloys usually varying in a continuous manner in each crystal. The number of metals capable of forming isomorphous mixtures with each other is small, the bismuth-antimony alloys being the only ones out of fourteen series investigated by M. Charpy in which this property was found to exist, but, on the other hand, there are many cases of definite compounds of two metals isomorphous with one of them. Thus, for example, microscopic study has enabled M. Charpy to detect a compound of tin and antimony containing about 50 per cent. of tin and isomorphous with antimony, although the freezing-point curve, worked out by Roland-Gosselin, and consisting of three branches having their concavities upwards, and meeting in two angular points or maxima, gives no direct indication of the relation between these metals.

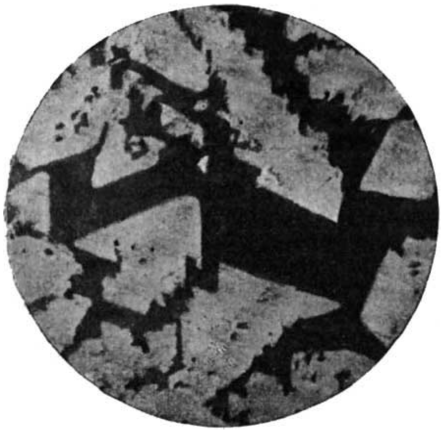

FIG. 3.—Alloy of tin, 75 per cent. ; antimony, 25 per cent.

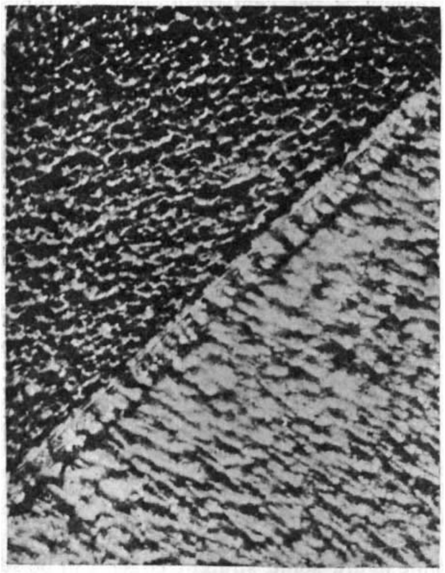

FIG. 4.—Pure gold. × 1000 diameters.

In Fig. 2, in which the alloy containing 10 per cent. of antimony is shown, the cubical crystals appear to consist of the 50 per cent. alloy set in a eutectic magma. Fig. 3 shows the alloy with 25 per cent. of antimony. As the proportion of antimony in the whole mass approaches 50 per cent., these crystals invade the whole field, and numerous minute cracks appear, on the edges of which is seen a secondary crystallisation without the interposition of an intermediate substance. This structure is characteristic of a pure or homogeneous substance, as in the beautiful micro-sections of pure gold prepared by Osmond and Roberts-Austen,[1] one of which is reproduced in Fig. 4. When the proportion of antimony is increased above 50 per cent. a eutectic magma shows no signs of reappearing. Similarly in the tin-antimony series, there is evidence of a compound containing 20 per cent. of antimony and isomorphous with silver, and in the silver-tin series a compound containing 30 per cent. of tin also appears to be isomorphous with silver. An investigation of the triple alloys of these metals would be interesting, as probably affording fresh examples of isomorphous series. T. K. R.

NOTES.

THE Municipal Council of Paris has made a grant of three thousand francs to the fund for the erection of a statue of Lavoisier in Paris.

M. MOUREAU has found in the records obtained at the Parc-St.-Maur Magnetic Observatory, a distinct disturbance evidently produced by the Indian earthquake of June 12. The exact time of the magnetic perturbation registered on that day is 11.37 a.m.

AT a recent meeting of the Durham and Northumberland Archæological Society it was unanimously resolved to obtain a portrait of the president, the Rev. W. Greenwell, F.R.S., Canon of Durham, to be placed in the Cathedral Library, Durham. A strong committee has been formed to further this object, and more than one hundred guineas have already been paid or promised. Further subscriptions are invited, and will be received by Mr. C. Rowlandson, at Messrs. Hodgkin's Bank, Durham, or by Mr. J. G. Gradon, Lynton House, Durham.

SIR RUTHERFORD ALCOCK, formerly president of the Royal Geographical Society, died on Tuesday, at the age of eighty-eight. The death is also announced of Prof. C. E. Colby, professor of organic chemistry in Columbia University.

DR. G. H. OTTO VOLGER, who died at Sulzbach, in the Taunus, on October 18, aged seventy-five, was at one time a notable figure in scientific and political circles in Frankfurt. A many-sided man, he contributed during his life a number of miscellaneous papers to various natural history and philosophical societies. He made several original contributions to geology, and wrote on the origin of springs, and on meteorological and mineralogical topics. During the time of his greatest activity, while resident in Frankfurt, he founded a society for the cultivation of sciences and arts called the "Freies deutsches Hochstift." Nearly forty years ago, when the old residence in the Hirschgraben, where Goethe was born, came into the market, he bought it. For a time he lived in it, with the direct object of gradually restoring it, room by room, to the state in which it existed (as described partly in *Dichtung und Wahrheit*, and partly in *Wilhelm Meister*) during the boyhood of the poet. This done, he made over the Goethe-house to the Hochstift, of which he was then, and for twenty-two years, the president.

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[1] Osmond and Roberts-Austen, "On the Structure of Metals, its Origin and Changes," *Phil. Trans.*, vol. clxxxvii. (1896), A., pp. 417–432.

After Frankfurt had ceased to be a free city, and imperial ideas swept over the old place, Dr. Volger found himself increasingly out of harmony with the new *régime*, and he withdrew from Frankfurt, first to Soden and lately to Sulzbach. In accordance with his express wish, his funeral at Frankfurt, on the 20th ult., was strictly private.

WE have received the Year-book of the Cambridge Philosophical Society, containing the addresses of the Fellows of the Society, and a list of the English and Foreign Societies with whom the publications of the Society are exchanged. It would appear that the Society is a convenient meeting-ground for Cambridge men engaged in scientific work. Papers for presentation to the Society are received by the Secretaries at the library of the Cambridge Philosophical Society, Cambridge. The Proceedings are published three times yearly—the publication of the Transactions is to be accelerated: the meetings are held every fortnight during full term. The following is a list of the new honorary members, elected May 24, 1897:—Major Macmahon, R.A., Prof. Charles A. Young (Princeton), Prof. Michelson (Chicago), Dr. Boltzmann (Vienna), Prof. Righi (Bologna), Prof. Mendeléeff (St. Petersburg), Sir Archibald Geikie, Prof. Dana (New Haven, Conn), Sir John Kirk, Prince of Monaco, Rev. Canon Norman (Durham), Prof. Wilhelm Pfeffer (Leipzig).

AN instructive fisheries exhibition, arranged to illustrate the fishing industries and the application of science to agriculture, was opened in the Zoological Museum of the University College, Liverpool, on Friday last. The exhibits are fully described in a guide to the exhibition published by the authorities. There is a series of the food fishes of this district, with the more important food matters of each; also a series of useful and useless fishes which compete with one another by eating the same food. Another exhibit contains specimens of the shell-fish of the district, showing stages in the life-history and growth, legal and illegal sizes, pearl formations, and pearls. A case is devoted to a display of printed matter, plates, photographs, drawings, and lantern slides, illustrating the publications, both administrative and scientific, of the Lancashire Sea Fisheries Committee, and other work bearing upon the fisheries of the district. The drawings and sketches include a number made by Prof. Herdman in illustration of his joint investigation with Prof. Boyce on the diseases of oysters and the connection between the oyster and disease. The exhibition will no doubt promote a more widespread interest upon the important question of sea-fishing, and thus assist in increasing the harvest of the sea. As Prof. Herdman pointed out at the opening ceremony of the exhibition, fishes are animals, their food is composed of animals, and their enemies are animals. In all the operations of their life, their feeding and breeding, and so on, they are subject to the same biological laws which regulate the lives of all animals in the sea. The investigation of fishery questions is applied biology, and if our fisheries are to be benefited they must be treated in a scientific manner. We do not trust to unaided nature for our supplies of bread-stuffs and beef. Why then should we trust to nature for fish? As there is an agriculture of the land, so there must be an aquiculture of the sea. Fishermen must in the future be farmers of the sea-shore, not hunters as they have been in the past.

SIR J. WOLFE BARRY, in an address at the opening of the new session of the Institution of Civil Engineers on Tuesday, said that the Institution now numbers on its roll 7075 persons. Reviewing the subject of the examinations recently instituted, he pointed out that they are intended to show that candidates for election into the class of Associate Members are acquainted with those general principles which have always been and must be recognised as the basis of the engineering profession, and also to make clear that each candidate possesses a somewhat fuller scientific knowledge of the elements of the particular branch in which his special training has lain. Practical knowledge is no less necessary now than formerly; for the examinations have not been instituted in lieu of other qualifications set out in the by-laws, but in addition to and supplementary of them.

WE have received the Report on the Administration of the Meteorological Department of the Government of India in 1896-97. It is divided into two parts; the first gives a general account of the results during the past year, and the second gives details of administration, chiefly in the form of tables. In the branch of marine meteorology two clerks have been regularly engaged in collecting data from ships visiting Calcutta and Bombay, and more than two thousand logs have been extracted. The observations are tabulated day by day, and are utilised in the preparation of charts of the Monsoon area. Observations have been made for some years past in certain forest areas with reference to the influence of forest-growth upon the distribution of rainfall, but have now been discontinued. Photogrammetric cloud observations have been regularly made since March last at Calcutta and Allahabad with the best type of instruments, which were constructed in Paris. Storm warnings are issued when necessary, partly from Calcutta and partly from Simla, and timely notice appears to have been given of all the more important disturbances. Among the various useful publications, we may mention the printing of the hourly observations formerly made at Trevandrum, under the superintendence of the late J. Allan Broun. The work of publication of the hourly values is now completed, and Mr. Eliot has undertaken their discussion, from which we anticipate some valuable results. He hopes to complete it during the present year.

A RECENT number of the Cape of Good Hope *Agricultural Journal* contains an important report on rinderpest by three Russian investigators, M. Nencki, N. Sieber, and W. Wyznikiewicz. These gentlemen were appointed by the Russian Government two years ago, to study how far sheep of the Merino family are subject to rinderpest, and at the same time to investigate the nature of the contagium of this disease. Their inquiries were carried on first in the Kuban-Cossack country, and later at the Institute for experimental medicine in St. Petersburg. They claim to have discovered the genuine contagium of rinderpest, which does not belong to the bacterial class of germs, but appears to partake more of the character of the amœba. After experimenting with about a hundred different media, in the hope of separating out the specific rinderpest agent, their efforts were rewarded by the discovery of "slightly luminous bodies in size from 1-3 μ, mostly round, a few being oval, pear-shaped, or drawn to a point. On the larger ones swellings may be seen, and, in a few, a grain lying in the centre. The larger and duller individuals show amœboid developments; some also have one, seldom two, ciliated protrusions." With fresh cultures of these organisms the rinderpest can be generated. Such cultures, however, are very perishable, and it is recommended to re-inoculate the culture daily. The best material for the cultivation of these organisms is apparently that which is rich in animal mucus, and by employing solutions containing an abundance of mucine, the authors succeeded in at length obtaining them in a living condition outside the animal's body. Great difficulty was experienced in ensuring the virulence of rinderpest cultures, but this trouble has to a considerable extent been overcome. "All organs and juices of diseased animals contain the rinderpest germ," the authors assert; and now that their methods have been brought before the scientific world, it only remains for other investigators to repeat and, we trust, confirm the important results which have been obtained.

The first number (November) of the new volume of the *Century Magazine* contains several contributions of scientific interest. Prof. H. F. Osborn writes an appreciative notice (accompanied by a portrait) of the late Prof. Cope. Shortly before his death Prof. Cope communicated to Mr. W. H. Ballou a number of interesting views which he held as the result of many years' study of the skeletons of Saurians, or lizard-like reptiles, found in various beds of the Rocky Mountains and other regions of the United States. He had arrived at some original and ingenious speculations with regard to the structures and habits of these animals, and, in addition, he completed the evolution of the carnivorous line of Saurians. Mr. Ballou now presents these views in an interesting article containing several vigorous illustrations, in which Mr. Knight well conveys Prof. Cope's impressions of how ancient Saurians lived and moved.—Mr. Jonas Stadling, who witnessed the start of Herr Andrée's balloon expedition towards the north pole, contributes to the *Century* a short description of the preliminary arrangements, accompanied by several reproductions of photographs of the balloon when beginning its journey. Mr. Stadling states that the balloon lost about fifty cubic metres of gas every twenty-four hours when it was standing filled in the balloon-house, from which rate of escape of gas it is concluded that the balloon would float about thirty days.—Accompanying an article upon Mrs. Cameron and her photographs, in the *Century*, is a fine reproduction of her successful portrait of Sir John Herschel.

The continually increasing difficulty of dealing with the sewage of large towns lends an interest to any scheme which appears to give satisfactory results in the purification of the effluent from the sewers so as to render it fit to flow into the rivers without polluting the water, and creating a nuisance. So great is the difficulty and cost of purifying the sewage up to the required standard, that Manchester has been advised that the only practicable way of disposing of the effluent from the sewage tanks, which now flows into and pollutes the Ship Canal, is by constructing a culvert fifteen miles long for the purpose of conveying it to the estuary of the Mersey at a cost of 258,000*l.*, and it is intended to apply to Parliament in the ensuing session for the necessary power to carry this work out. The sludge from the tanks is to be taken out to sea. The County Council of London employ a fleet of six steamers which are regularly engaged in conveying the sludge deposited in the outfall tanks at Barking and Crossness a distance of fifty miles to Barrow Deeps at an annual cost of 32,000*l.*; the material so removed amounting to over two million tons a year. At Exeter a new system of "septic" treatment has been tried, and it is described by Mr. Cameron, the City Surveyor, in a paper read before the Devon and Exeter Architectural Society. It is claimed for this system that the sewage treated by this process in the tanks is brought under the influence of micro-organisms; the decomposition of the matters which would otherwise undergo putrefaction being effected by the presence of these micro-organisms, their products being ammonia and carbonic acid with some other gases. The bottom of the tanks after six months' use, when exposed, showed only a thin layer of black earthy matter, together with mud and grit. The effluent is not offensive, and it is stated that it does not ferment. At Wolverhampton recent experiments have shown that filtering the sewage through coal-dust is an effectual way of purifying it, and that a very satisfactory effluent can be obtained by passing 200 gallons of sewage through one square yard of filtering material in twenty-four hours.

The interest of the many recent observations of earthquake-pulsations has led Dr. M. Baratta, who is preparing a history of seismology, to search for early accounts of these phenomena in various scientific works. He has succeeded in discovering several forgotten records, which are described in a paper in the *Rivista Geografica Italiana* (1897, fasc. viii.). Those of pulsations observed with magnetic apparatus date back to 1681, with astronomical instruments to 1767, and with levels to 1833. Dr. Baratta's examples are taken from French and Italian sources; and it can hardly be doubted that others, equally interesting, would be obtained from an examination of English and German works.

In an interesting and well-illustrated little memoir on "L'Echelle réduite des expériences géologiques," in the *Revue de l'Université de Bruxelles*, M. W. Prinz sets himself to answer the question whether experiments conducted to explain geological phenomena become untrustworthy on account of the small scale and different materials with which they are necessarily performed. His answer is decisively negative. The results of experiments like those of Cadell on the production of planes of major and minor thrust are exactly similar to those produced in the planing of steel, the difference in scale between the two classes of experiments being greater than that between Cadell's thrusts and those of the Highlands which they were intended to explain. With regard to difference of material results similar to those of Daubrée on plate-glass may be reproduced in mastic, cast-iron, modelling clay, and half-solid mortar; in all cases cracks similar to the joints and cleavage in rocks are produced. Again, the differential movement which makes marginal crevasses in glaciers may be imitated in the cutting of glass by a wheel, by drawing a needle over dry plaster, by a pencil on paper, by footsteps, or by dragging a cane over thick snow, and even by moving a cart-wheel over a muddy road. Further instances, including the action of a diamond on glass, and a bibliography, conclude this interesting memoir.

Mr. Albert F. Woods, of the Division of Vegetable Physiology and Pathology, United States Department of Agriculture, describes in the *Botanical Gazette* a novel method of preserving the green colour of plants for exhibition purposes. The principle involved is to bring about a combination of the chlorophyll in the cells of the plant with copper. The resulting compound, copper phyllocyanate, is practically insoluble in any of the ordinary preserving media except strong alcohol, and is not destroyed by light. The resulting green can scarcely be distinguished from the normal chlorophyll green. The process described is a somewhat complicated one. After removing the air as completely as possible from the surface and from the intercellular spaces by immersion in 90-95 per cent. alcohol, or by means of the air-pump, the tissues are placed in a 5 per cent. solution of glycerol containing enough dissolved copper sulphate or copper acetate to give it a bluish tint. The uncombined copper is dissolved out by a dilute glycerin-formalin solution, and the object may be preserved in this solution or in any of the usual media except strong alcohol.

The number of printed specifications of patents in the Patent Office Library at the present time is well over a quarter of a million. To search through these specifications in order to obtain information as to the novelty of an invention is thus a tremendous task even for the trained expert; yet by omitting such a search many a patentee has found, after paying his fees, that his patent was worthless, because it had been anticipated; for the Patent Laws of this country make no provision for an official search as regards novelty, and all patents are taken out at the risk of the inventors. The searcher is, however, greatly assisted in his task by a series of indexes and abridgments published by the Patent Office as a guide to the specifications themselves, and freely distributed to the principal public libraries in this country. The abridgments give a general description of the nature of every invention patented, and the object of their publication is to enable the would-be patentee to carry out, at any rate in some cases, what may be termed a fireside search. The volume containing abridgments of patents belonging to the class of *Philosophical Instruments*, and referring to the years 1884–88, has been sent to us by the Comptroller-General of Patents. In it we find concise descriptions (usually illustrated by diagrams) of optical, nautical, surveying, mathematical, and meteorological instruments and accessories. Some of the subjects of the patents are very trivial, while others are most ingenious; so an examination of the whole will be found amusing as well as instructive. The favourite scientific instruments upon which human ingenuity exercises its powers seem to be barometers, clinometers and other instruments for measuring vertical angles, magnetic compasses, hygrometers and hygroscopes, lenses, levels and plumbing instruments, logs and leeway indicators, magic-lanterns and other projecting apparatus, mathematical drawing instruments, microscopes, reflectors, protractors, sounding apparatus, spectacles and eye-glasses, surveying instruments, telemeters, thermometers and pyrometers, and stands for cameras and telescopes. The volume thus provides the material for a liberal education in the construction of scientific apparatus, in addition to which it is full of interest to every one with an inventive turn of mind.

In the current number of the "Annotationes Zoologicæ Japonenses" Mr. Nishikawa describes a newly-discovered mode by which the eye of the lower side of a flatfish travels round to the upper side during metamorphosis. Agassiz observed that in the majority of flatfishes the eye of the (eventually) blind side travels round the dorsal edge of the head until it attains its final position, and that not until this rotation is completed does the dorsal fin grow forwards beyond the level of the eyes. In *Plagusia*, on the other hand, the dorsal fin is known to grow forwards to the snout while the eyes are still symmetrical, and the right eye attains its final position on the left side of the fin by penetrating, in the course of its rotation, through the soft tissues at the base of the fin. In the fish observed by Mr. Nishikawa the dorsal fin also grows forward before the rotation of the right eye, but this anterior extension does not unite with the head until after the rotation is completed. Its ventral margin is contiguous with the dorsal surface of the head except posteriorly where there is a distinct hole, bounded by the head and the anterior extension of the fin, for the passage of the right eye, which thus travels round the dorsal side of the head without sinking into its tissues. It is clear, as Mr. Nishikawa points out, that the mode by which the change of position is effected in this fish is intermediate between that observed in ordinary flatfishes, which are destitute of an anterior extension of the dorsal fin at the time of transformation, and that which is exhibited by *Arnoglossus* and *Plagusia*, in which types the anterior extension of the fin coalesces with the head before rotation of the eye, and requires to be perforated for the passage of that organ. The genus of the Japanese fish could not be ascertained with certainty, but it is believed to be closely related to the genus *Plagusia*.

The forty-third annual report dealing with the work of the Australian Museum, Sydney, during the year 1896, has just come to hand. The most important presentations to the Museum during the year was the Dobroyde collection of Australian birds and eggs, containing several thousand skins and eggs—the result of forty years collecting. This was purchased by the Government of New South Wales from Mr. J. S. Ramsay, and transferred to the custody of the Trustees of the Museum. Another valuable donation is a mass of meteoric iron weighing just over 44 lb., found on the Nocoleche Holding, near Wanaaring, New South Wales, and presented to the Museum by Mr. G. J. Raffel. The semi-fossil remains of a Dugong, discovered in the excavations for a canal, near Sydney, have also been presented to the Museum. This is the first instance of the discovery of Dugong remains so far south. Among other noteworthy acquisitions are: The bower or playground of Newton's Bower-bird (*Prionodura newtoniana*), types of the Honey-ants of the Horn Central Australian Exploring Expedition, and a further collection of bird skins from the same, some ancient Peruvian urns, a collection of Australian Coleoptera, and the remains of the Asiatic elephant Jumbo. Mr. Charles Hedley, one of the officers of the Museum, who was permitted to accompany the Royal Society's Coral Reef Boring Expedition, succeeded in amassing an interesting collection during his stay on Funafuti, particularly of invertebrate and ethnological subjects. The collections are now in process of description by the scientific staff of the Museum. A commencement has been made at the works for extension of the Museum buildings, for which a sum of 6000*l.* was voted by the New South Wales Parliament in 1895. The old ant-eaten roof has been removed, and a new roof, built of steel, wood and copper, has been constructed. While this was in progress a thorough inspection of the building was made to ascertain the extent of the ravages of the "white ant," with the result that further depredations were discovered. These terrible termites were found to have penetrated under the floor of the ethnological hall, and completely destroyed the woodwork of that structure as of the roof. It is not surprising to read that discoveries of this kind gave the curator, Mr. R. Etheridge, jun., plenty of cause for anxiety during last year. The chief change in the staff of the Museum is the appointment of Mr. W. J. Rainbow to succeed the late Mr. F. A. A. Skuse as officer in charge of the entomological collections.

The difficulty of the problems which await the investigator into the chemistry of the enzymes is well illustrated by the results, published in the current *Berichte*, of an attempt made by A. Wroblewski to isolate diastase. The greater part of the substance usually known as diastase was found to be a carbohydrate, which yielded arabinose when boiled with acids. The active constituent, on the other hand, was found to have all the properties of a protein, although the author could not be sure that he had prepared it in an absolutely pure state. The proteid nature of the enzyme follows from the facts that the residue left after removing the inactive carbohydrate shows all the characteristics of a proteid body, and at the same time exerts the diastatic action on starch. This research affords, for the first time, a definite experimental basis for the enrolment of this enzyme among the proteids, although many investigators had taken this view of its nature on general grounds.

The *Bulletin* of the Bussey Institution, vol. ii. part 6, published under the authority of Harvard University, consists of a paper by Prof. F. H. Storer, on some of the chemical substances in the trunks of trees, which serves to show that other substances besides starch are stored up in large quantities as reserve food-material in the winter, to be converted into sugars in the spring.

The additions to the Zoological Society's Gardens during the past week include a White-crested Tiger Bittern (*Tigriosoma leucolophum*) from West Africa, presented by Dr. J. F. Dell; an Alligator (*Alligator mississippiensis*) from Southern North America, presented by Mr. J. H. Renals; a Common Chamæleon (*Chamæleon vulgaris*) from North Africa, presented by Mr. G. E. Gratton; two Great-billed Rhea (*Rhea macrorhyncha*) from North-east Brazil; a Pennant's Parrakeet (*Platycercus pennanti*) from Australia, deposited; six Common Rhea (*Rhea americana*), bred in Holland; a Many-coloured Parrakeet (*Psephotus multicolor*) from Australia, purchased; a Sambur Deer (*Cervus aristotelis*, ♀), a Hog Deer (*Cervus porcinus*, ♀) from India, received in exchange; three Shaw's Gerbilles (*Gerbillus shawi*), born in the Gardens.